-------- MEMBER IN THE SPOTLIGHT - CITY OF GLASGOW – JANUARY 2009 --------

Wireless communications for traffic control in Glasgow

Glasgow has 800 sets of traffic signals within the city which were formerly analogue controlled. In the 1970s, the city was a test site for the adaptive urban traffic control system, SCOOT, using fixed cables and covering 100 sets of signals. Scoot was not rolled out throughout the network as the sensor arrays and associated communications required by SCOOT were too expensive so fixed time urban traffic control was introduced at 500 signals. In 2003, the SCOOT control was brought back alongside fixed-time signals to support bus corridors and bus priority measures across a network of 340 sets of lights.

The driving force to move beyond fixed wire and analogue communications was the introduction of bus priority corridors. The old analogue infrastructure was a legacy for telecoms providers because they had moved on to digital systems and it was proving unreliable and increasingly costly to support as it became a minority business for the telecoms suppliers. Maintenance costs were therefore increasing above the rate of inflation and the telecom providers were threatening to withdraw the analogue service in the UK. Additional challenges included the Urban Traffic Management Control concept that was emerging in the UK (http://utmc.uk.com/) and the explosion of digital communications. Glasgow felt it had no choice but to move forward.

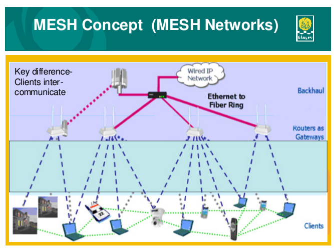
Implementation

A 2004 desktop study compared the costs of different communication configurations per year/site (copper, wireless, hybrids) –The study led to the implementation of two digital trials: one based on a copper wire network at 10 sites and the second based on two different wireless mesh-based solutions at a further 7 sites. The city council decided against a GPRS-based system due to the lack of service stability and operating charges caused by network disruptions. The high cost of a GPRS system in the 2004 study was an additional factor, although this no longer reflects reality due to high competition which has brought costs down significantly.

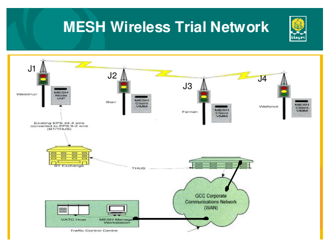
<u>The hard wire digital trial</u>

The main advantage of the hard wire digital trial pertained to the reuse of parts of an existing network and the results demonstrated good performance, reliability, a good service by the service provider and the use of standard equipment. The main drawbacks were the installation costs and disruptions to traffic whilst providing physical connections to roadside controllers.. From a financial perspective, the revenue costs were equivalent to an analogue system.

<u>The wireless Mesh digital trial</u>



The wireless mesh trial used two different WiFi solutions including a product that is not fully compliant with existing IEEE WiFi wireless standard (802.11) but works in the same frequency spectrum of 2.4GHz. The Glasgow City Council WiFi group had initially wanted the traffic department's wireless system to act as a lever for other council wireless services but this was resisted by the department for real-time traffic control due to concerns over circuit loading (possible message delays) and security. The wireless solution adopted has 3 active frequency channels compared with 1 under conventional WiFi and can dynamically hop between them to avoid those that may be locally congested or suffering interference from other WiFi traffic. This capability provides more resilience but at a higher cost.

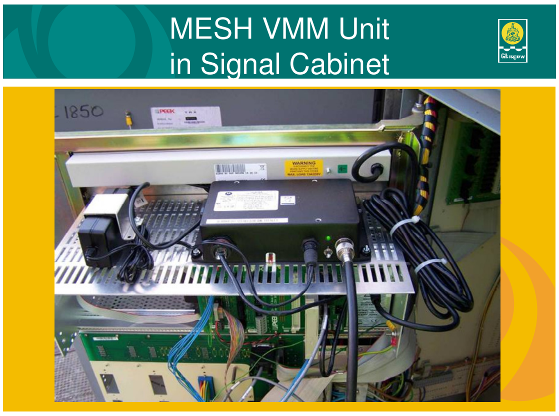


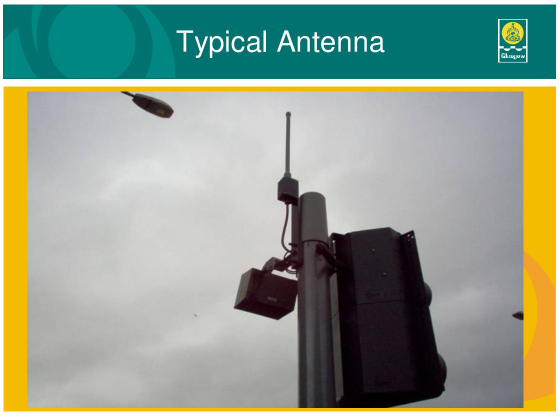
Within a mesh network, the clients (eg, traffic signals, VMS, cameras, vehicles) can talk to one another on the network on a peer-to-peer basis. For urban traffic control, this means that if a link is lost in the network between a set of signals and the main gateway, communication can be automatically rerouted via adjacent sets of signals. The Mesh trial lasted 63 days. Observed plan compliance errors were largely attributed to data configuration or site wiring problems and readily resolved through minor reconfiguration of the sites and their data. One digital communications issue noted in relation to centralised real-time control systems such as SCOOT where control message timing is important is the potential delay to communications packets within the network at times of heavy communications loading. Where modern versions of SCOOT accommodate this by improved message control some of the older versions may occasionally interpret delayed messages as control errors.

In reviewing the costs of the trialled systems compared with the old analogue system, the hard wire (SDSL) installation was higher and annual revenue only slightly lower. By contrast, the MESH system showed high installation costs but far lower revenue costs at a single site, with a lower unit cost for both installation and revenue as the number of sites increase due to the need for less physical connections and associated line charges.

As a result of the trials, Glasgow decided to install the Mesh system and this has been in place at 200 sites since 2005. Even though Mesh is not compliant to the IEEE Standard, it is possible to add a node to the gateway to make it compliant. In addition, the city uses GSM, ADSL and GPRS for remote traffic signals, CCTV Cameras, and for VMS. The bus location system (BIAS) uses Private Mobile Radio (PMR). This mix of technologies has proven to be the most cost efficient for Glasgow.

Conclusions
Glasgow's decision to move from cable to wireless was not taken without concern. Furthermore, the choice of a solution that does not use an IEEE Standard was not made lightly. However, this solution was perceived as being more robust than a typical WiFi frequency that would be subject to increasing competition from other mainstream wireless systems and services.





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